Quick Reference

PAC II

Tandon

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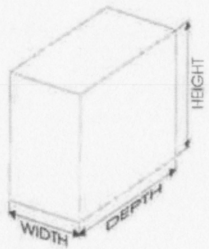
2 Specifications

Physical Dimensions (without floppy option)

Width	160mm
Depth	399mm
Height	320mm
Weight	9.7Kg



Power Requirements

Power	130W
Voltage range	85 to 260 VAC
Frequency	47 to 63 Hz

Operating Environment

Temperature	10°C to 40°C
Relative Humidity	15 to 90 percent (noncondensing)
Altitude	-150 to 3000m maximum.

Non-Operating Environment (PacII)

Temperature	-20°C to 60°C
Relative Humidity	10 to 95 percent (noncondensing)
Altitude	-500 to 13000m

Non-Operating Environment (DataPacII)

Temperature	-29°C to 66°C
Relative Humidity	10 to 95 percent (noncondensing)
Altitude	-500 to 7500m

Model Numbers 3

PacII with 386sx/20 processor board	T22100
PacII with 386sx/20c processor board	T22101
PacII with 486sx/20 processor board	T24100
PacII with 486/33 processor board	T24300
386sx/20(25) processor board	TH2002 (TH2026)
386sx/20(25)c processor board	TH2004 (TH2028)
486sx/20(25) processor board	TH2014 (TH2030)
486/33 processor board	TH2008
486/50 processor board	TH2018
3.5" floppy drive option	TM1006
3.5"/5.25" stacked floppy drive option	TB0200
InPacII receptacle assembly	TA2000
AdPacII receptacle assembly	TA1000
AdPac/mx receptacle assembly	TA3000
ISA host adapter	TB5202
EISA host adapter	TB5204
MCA host adapter	TB5203
Macintosh kit	TJ3002
MCA/Macintosh SCSI cable	TA4001
Standard SCSI cable	TA4002
In-line SCSI terminator	TA4000

PacII A highly compact PC compatible system which allows the removal of its hard drives (DataPacII) so that data can be transported and/or backed up with ease. The processor of the PacII is contained on a removable board to allow easy upgrading of the system. The floppy drive option attaches to the top of the system.

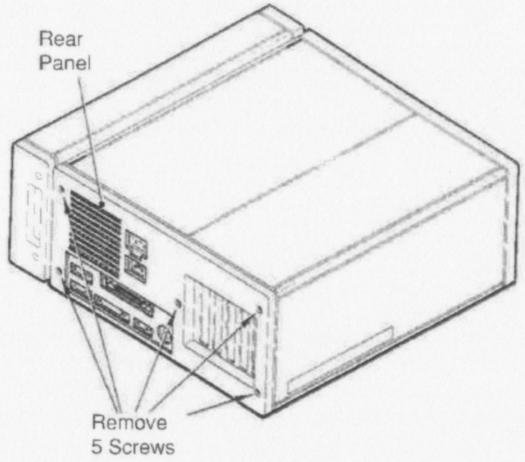
InPacII A single DataPacII receptacle with a SCSI interface which can be added into most PC compatible systems.

AdPacII An encased single DataPacII receptacle with a SCSI interface and internal power supply which may be added onto most PC compatible and Macintosh systems.

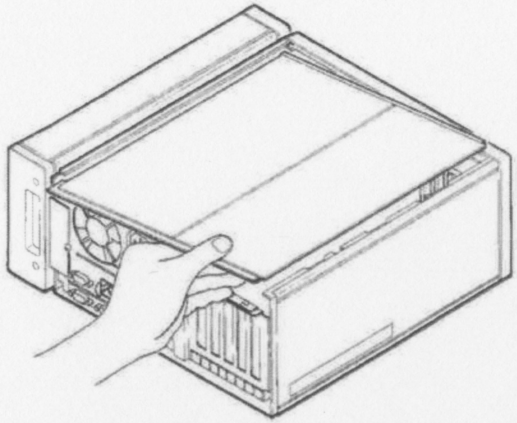
AdPac/mx An encased single *old style* Data Pac receptacle with a SCSI interface and internal power supply which may be added onto most PC compatible and Macintosh systems.

The internal components of the PacII system are static sensitive and may be damaged by electrostatic discharge. Use correct earthing procedures before and whilst opening these systems.

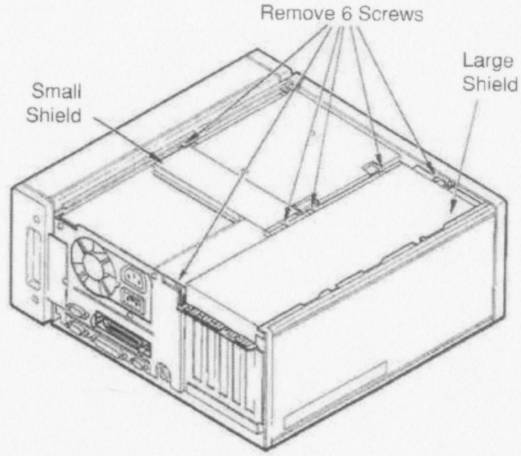
To open the system, first lay it on its side and remove the five screws which hold the Rear Panel in place and remove the rear panel.



Next, remove the side panel by sliding it back roughly 20mm and lifting it off.

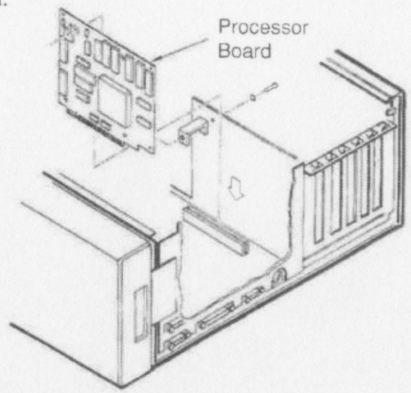


With the side panel removed, the inner RF interference shields can be seen. Remove the two screws securing the small shield and remove this item. Next, remove the four screws which hold the large shield in place. Once the large shield has been removed, access is gained to the expansion board slots, the processor board, the system BIOS & keyboard controller and the system jumpers.

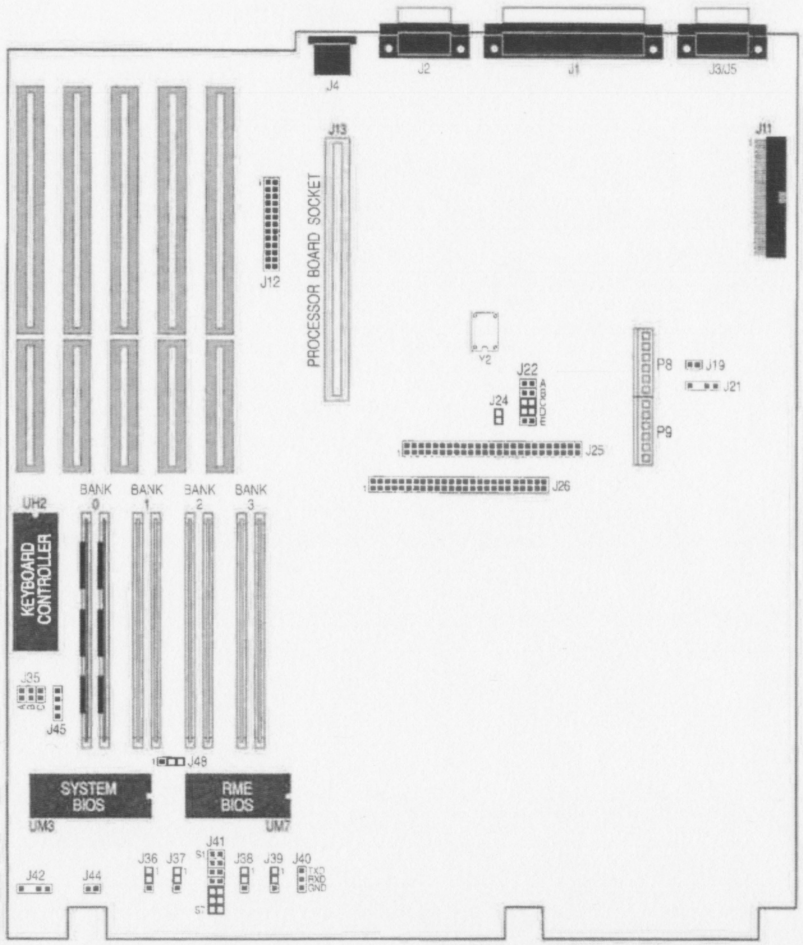


Changing the Processor

The processor of the PacII system is mounted on a separate board which plugs into the motherboard, thus allowing the system to be upgraded. The processor board is mounted between the power supply and the expansion slots and is held in place by a single screw and bracket. With the screw removed, the card can be pulled out and replaced with another. New processors are automatically configured when the system is powered up and no jumper alterations are required.



Motherboard Layout



Part Number: 194150-001

Connectors

J1	Parallel port	J21	Battery connector
J2	VGA video port	J25	External SCSI port connector
J3	Serial port 1	J26	Receptacle SCSI port connector
J4	Keyboard connector	J40	RME test header
J5	Serial port 2	J42	Reset switch connector
J11	Diskette drive port	J44	Speaker connector
J12	VGA feature connector	J45	Real Time Clock test header
J13	Processor board socket	P8/9	Power supply connectors

Motherboard Configuration

The motherboard of the PacII system, known as the *Dragon*, is shown opposite. The processor is situated on a separate board which connects to J13 (see pages 10, 11 and 12).

J35-A	J35-B	Memory Setting
OFF	OFF	640 KB base memory
OFF	ON	512 KB base memory
ON	OFF	256 KB base memory

J35 C	ON	Disable security
	OFF	Enable security

Jumper	ON	OFF
J19	Clear CMOS RAM (no effect on RTC)	Normal CMOS RAM operation
J24	Terminator power supplied to SCSI bus	Terminator power not supplied to bus
J41 S6	DataPacII/0 set for normal ejection	DataPacII/0 receptacle locked
J41 S7	DataPacII/1 set for normal ejection	DataPacII/1 receptacle locked

Jumper	1-2	2-3
J36	RME BIOS size 16KB	RME BIOS size 32KB
J37	Enable on-board SCSI host adapter	Disable on-board SCSI host adapter
J38	DataPacII/0 set for normal ejection	DataPacII/0 set for Emergency Eject
J39	DataPacII/1 set for normal ejection	DataPacII/1 set for Emergency Eject
J48	BIOS chip is standard EPROM	BIOS chip is Flash EPROM

Jumper block **J22** is used to select Super VGA modes. The settings of this jumper block are explained on **page 37**. Positions **C** and **D** should remain **ON** and position **E** should be **OFF**.

If an adapter video BIOS is found at **C000H** during boot-up, the on-board video controller will be disabled automatically.

Positions **S1** and **S2** of jumper block **J41** are reserved and should remain **OFF**.

J41-S5	J41-S4	J41-S3	RME ID
ON	ON	ON	0
ON	ON	OFF	1
ON	OFF	ON	2
ON	OFF	OFF	3
OFF	ON	ON	4 ⚠
OFF	ON	OFF	5 ⚠
OFF	OFF	ON	6
OFF	OFF	OFF	7 ⚠

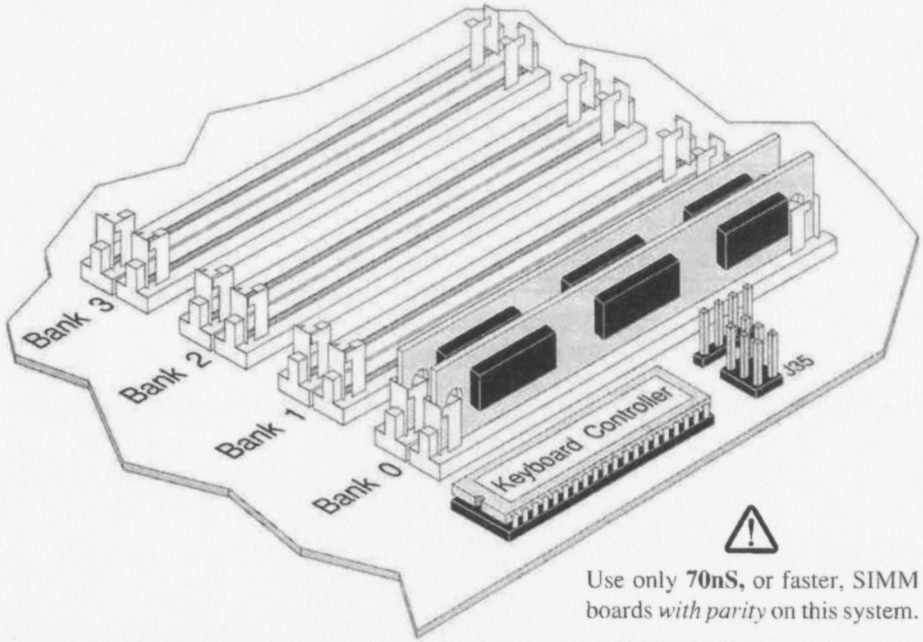
⚠ The DataPacII receptacles 0 and 1 are hardwired to SCSI IDs 4 and 5 respectively and the on-board host controller is set to ID 7. The setting of the RME ID must not coincide with these IDs or with any other SCSI device in the system, however, more than one RME may occupy the same SCSI ID or they can be set separately.

The on-board SCSI controller BIOS address is selected through System Setup either automatically or manually (see page 9).

Terminator power must be supplied to the SCSI bus by at least one device. Best results are obtained if the two devices at the extreme ends of the cable supply the terminator power.

Memory Layout

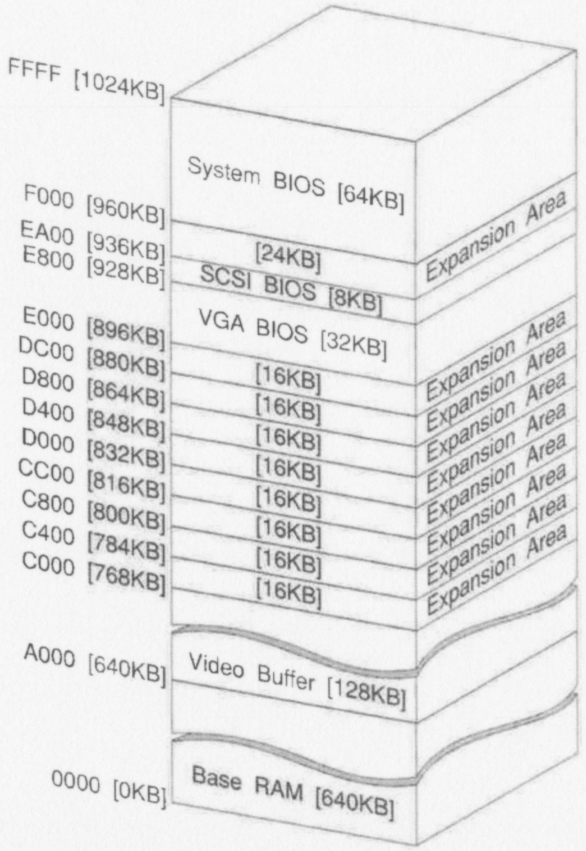
The PacII motherboard has eight SIMM sockets split into four banks of two sockets. Each socket can accommodate 256KB, 1MB or 4MB SIMM boards although sizes may not be mixed within the same bank. The supported memory combinations are given in the table shown below. The system will operate faster if more banks are filled with the same size SIMM boards due to the Page Mode Interleaving method employed.



Use only **70nS,** or faster, SIMM boards *with parity* on this system.

Bank 0	Bank 1	Bank 2	Bank 3	Total
256KB	Empty	Empty	Empty	512KB
256KB	256KB	Empty	Empty	1MB
256KB	256KB	256KB	Empty	1.5MB
256KB	256KB	256KB	256KB	2MB
1MB	Empty	Empty	Empty	2MB
1MB	256KB	Empty	Empty	2.5MB
256KB	256KB	1MB	Empty	3MB
256KB	256KB	1MB	256KB	3.5MB
1MB	1MB	Empty	Empty	4MB
1MB	1MB	256KB	Empty	4.5MB
1MB	1MB	256KB	256KB	5MB
1MB	1MB	1MB	Empty	6MB
1MB	1MB	1MB	256KB	6.5MB
1MB	1MB	1MB	1MB	8MB

Bank 0	Bank 1	Bank 2	Bank 3	Total
4MB	Empty	Empty	Empty	8MB
4MB	256KB	Empty	Empty	8.5MB
256KB	256KB	4MB	Empty	9MB
4MB	1MB	Empty	Empty	10MB
1MB	1MB	4MB	Empty	12MB
1MB	1MB	4MB	1MB	14MB
4MB	4MB	Empty	Empty	16MB
4MB	4MB	256KB	Empty	16.5MB
4MB	4MB	256KB	256KB	17MB
4MB	4MB	1MB	Empty	18MB
4MB	4MB	1MB	1MB	20MB
4MB	4MB	4MB	Empty	24MB
4MB	4MB	4MB	4MB	32MB



The diagram represents a map of the first 1MB of memory space on the PacII system. Certain regions are fixed in their functionality such as the Base RAM, Video Buffer, VGA BIOS and System BIOS, however, the memory space between C000 and DFFF can be used for accomodating expansion ROM's and expanded memory page frames. The main user RAM is 2MB as standard and this is expandable up to 32MB. Installed memory above 16MB is only accessible as expanded memory due to the 24-bit address architecture used in the system. The PacII has the ability to Shadow the System, VGA and expansion BIOSs, using a portion of the remapped 384KB area. The remainder of the 384KB portion (or all of it if the BIOS shadowing is disabled) is *floated* to the top of all other extended memory.

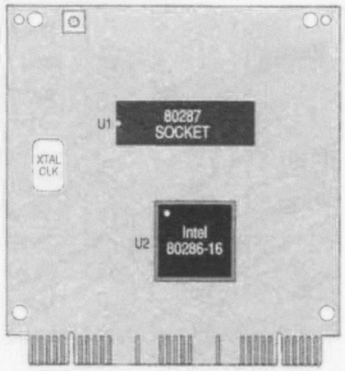
The on-board SCSI controller uses a 16KB data area. Its address can be selected through System Setup, either automatically (the system scans for free addresses starting at DC00 and moves down until it finds space) or manually by pressing the PgUp or PgDn keys when that entry is highlighted until the required address is displayed.

When using an expanded memory driver (i.e. EMM386, 386MAX, QEMM, Windows 3.x enhanced mode, etc.) the system will hang if the driver coincides with the SCSI data area. The data area cannot be detected as a BIOS would be, so it should be fixed within System Setup to a free 16KB memory space between C000 and DC00 (DC00 is the default). That area should then be excluded from the memory driver within the command line in CONFIG.SYS. For example, the command line for EMM386.SYS would be:

```
DEVICE=EMM386.SYS X:DC00-DFFF
```

10 286/16 and 386sx/20(25) Processor Boards

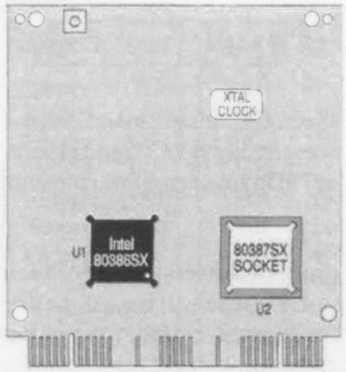
This processor board, known as *Pixie*, for the PacII system holds an 80286 processor clocked at 16MHz and has a socket labelled **U1** for the addition of an 80287 co-processor. Refer to page 5 for brief instructions on fitting the processor option.



Supplied in the US only

Part Number: 194660-001

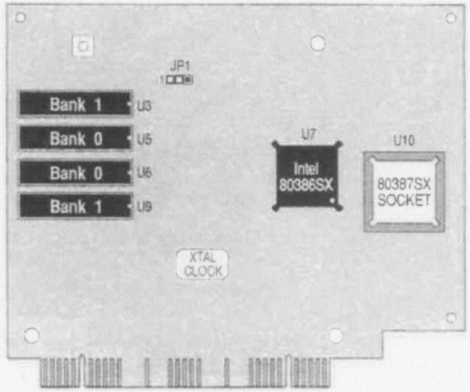
This processor board, known as *Nixie*, for the PacII system holds an 80386sx processor clocked at 20 or 25MHz and has a socket labelled **U2** for the addition of an 80387sx/20(25) co-processor. Refer to page 5 for brief instructions on fitting the processor option.



Part Number: 194800-001

386sx/20(25)c Processor Board with Cache 11

This processor board, known as *Manticore*, for the PacII system holds an 80386sx processor clocked at 20 or 25MHz, has on-board cache RAM and a socket labelled **U10** for the addition of an 80387sx/20(25) co-processor. There are four I.C. sockets, split into two banks, which can accommodate either 8KB or 32KB Static RAM chips and JP1 must be set according to the size of chips used. Refer to page 5 for brief instructions on fitting the processor option.



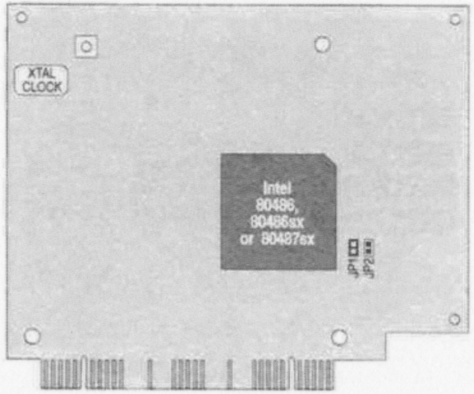
Part Number: 195330-001

Bank 0	Bank 1	JP1	Cache Size	Cache Type
8KB	Empty	1-2	16KB	Direct Mapped
Empty	8KB	1-2	16KB	Direct Mapped
8KB	8KB	1-2	32KB	2 Way Set Associative
32KB	Empty	2-3	64KB	Direct Mapped
Empty	32KB	2-3	64KB	Direct Mapped
32KB	32KB	2-3	64KB	2 Way Set Associative

Bank 0 is formed by sockets U5 and U6. Bank 1 is formed by sockets U3 and U9. No mixing of SRAM sizes is permitted.

12 486 Processor Board

This processor board, known as *Gadget*, for the PacII system can accommodate; the 80486 processor at speeds of 33 or 50MHz, an 80486sx chip running at 20 or 25MHz or an 80487sx also running at 20 or 25MHz. The jumpers JP1 and JP2 are used to set the board for the processor fitted. The crystal clock runs at double the rated speed of the processor. Refer to page 5 for brief instructions on fitting the processor option.



Part Number: 195050-001

JP1	JP2	Processor Fitted
ON	OFF	80486 or 80487sx
OFF	ON	80486sx

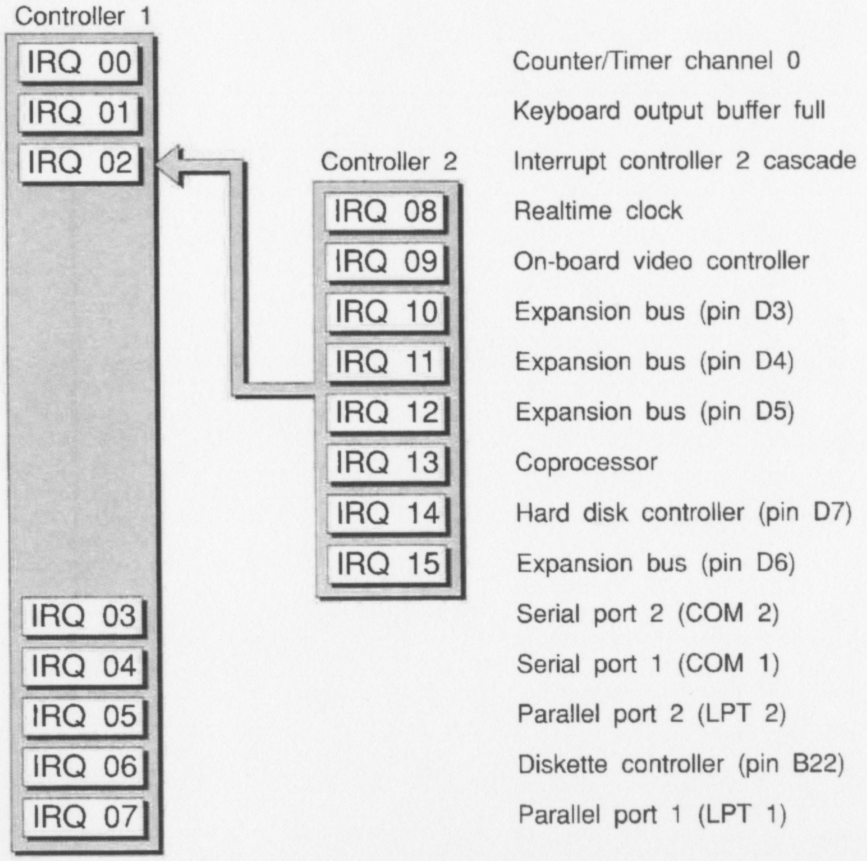
Input/Output Map 13

The table below shows the various I/O addresses which are reserved or suggested for sub-components and optional controllers within the system.

Address	Device or Option Board
000H-01FH	DMA Controller 1
020H-03FH	Interrupt Controller 1
040H-05FH	Timer
060H-06FH	Keyboard Controller
070H-07FH	Real Time Clock, NMI Mask
080H-09FH	DMA Page Register
0A0H-0BFH	Interrupt Controller 2
0C0H-0DFH	DMA Controller 2
0E0H-0FFH	Math Co-processor
1F0H-1F8H	Fixed Disk Controller
200H-207H	Game I/O
278H-27FH	Parallel Printer Port 2
2E1H	GPIB Adapter 0
2E2H-2E3H	Data Aquisition Adapter 0
2B0H-2DFH	Alternate Enhanced Graphics Adapter
2F8H-2FFH	Serial Port 2
300H-31FH	Prototype Card
360H-36FH	PC Network
370H-377H	Diskette Controller, Secondary
378H-37FH	Parallel Printer Port 1
380H-38FH	SDLC, Bisynchronous 2
390H-393H	Cluster Adapter 0
3A0H-3AFH	Bisynchronous 1
3B0H-3BFH	Monochrome Display & Prtr Cont
3C0H-3CFH	Enhanced Graphics Adapter
3D0H-3DFH	Colour/Graphics Adapter
3F0H-3F7H	Diskette Controller, Primary
3F8H-3FFH	Serial Port 1
580H-58FH	Tandon Mark IV/ARC Controller
6E2H-6E3H	Data Aquisition Adapter 1
790H-793H	Cluster Adapter 1
AE2H-AE3H	Data Aquisition Adapter 2
B90H-B93H	Cluster Adapter 2
EE2H-EE3H	Data Aquisition Adapter 3
1390H-1393H	Cluster Adapter 3

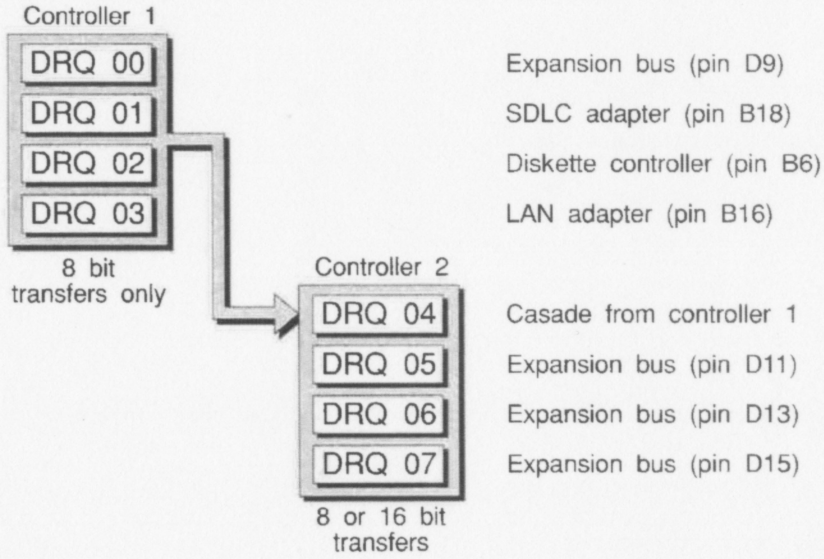
14 IRQ Map

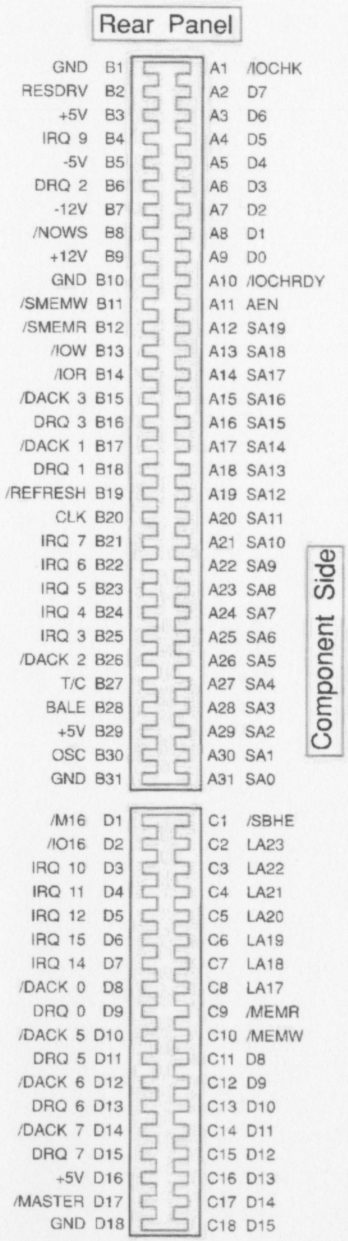
The diagram below indicates which interrupt request lines are generally available or suggested for sub-components and optional controllers within the system. The diagram is arranged to show the hierarchy of the interrupt system with the highest priority interrupt at the top of the diagram and the lowest priority at the bottom. The second interrupt controller is cascaded into channel 2 of the first controller for downward compatibility reasons.



DMA Map 15

The diagram below indicates which DMA request lines are generally available or suggested for sub-components and optional controllers within the system. Controller 1 is cascaded through DRQ 04 for downward compatibility reasons.





The PacII system has five 16-bit ISA (AT type) Input/Output sockets.

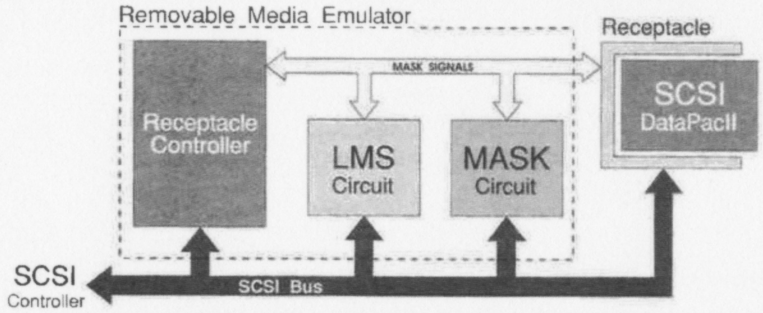
Signal names prefixed with "/" are active low.

The ISA signals of the I/O connector shown on the opposite page are explained below.

SA0-SA19	Twenty latched system address lines.
LA17-LA23	Unlatched address lines which, when used in conjunction with the standard address bus, enable 16 bit boards to address a full 16 MBytes.
D0-D15	Sixteen bi-directional data lines.
BALE	Buffered Address Latch Enable. This signal goes high to indicate that a valid address is present on A0-A19.
/SBHE	System Bus High Enable, goes low when D8-D15 are being used.
IRQ3-IRQ7 IRQ9-IRQ15	Eleven maskable interrupt request lines. IRQ13 is absent from the bus because it is reserved for the system coprocessor.
DRQ0-DRQ7 /DACK0-/DACK7	DMA request and acknowledge lines used when a peripheral wishes to take over control of the system address bus.
/IOCHRDY	Used by a slower peripheral board to generate I/O wait states.
/IOR, /IOW /SMEMR, /SMEMW	I/O and memory read/write strobe signals. /SMEMR & /SMEMW are only active on memory cycles within the first 1MB of system memory.
OSC	A 14.31818MHz clock used by some video boards.
CLK	The bus clock signal which runs at 8MHz.
AEN, T/C	Address Enable & Terminal Count, signals used in DMA cycles.
/IOCHK	I/O Channel Check, alerts the processor to parity and other errors via a NMI interrupt.
/MEMR, /MEMW	Memory read & write strobes which are active on all memory cycles.
/MASTER	This signal allows a board to become a bus master on the ISA bus.
/M16, /IO16	Signals used by a peripheral board to indicate that it can handle 16 bit transfers.
RESDRV	Indicates that the system is being reset.
/NOWS	Used by boards to indicate that additional wait states are not required.

The Removable Media Emulator

The interface for the DataPacII systems is based upon the internationally recognised SCSI (Small Computer Systems Interface) which has been in existance for over ten years and gives high performance results. While it is not uncommon to find SCSI storage devices which allow the media to be removed (i.e. tape backups, optical disks, etc.), the bulk of these devices remain connected to the SCSI Bus. When a DataPacII is ejected, however, the whole drive and its control circuitry are removed as a sealed unit. In order to do this, Tandon has produced custom circuitry which permits a complete SCSI device to be removed from the bus whilst the system is fully operational. This circuitry is collectively termed the *Removable Media Emulator* or, inevitably, *RME* for short and encompases three functional blocks as illustrated below.



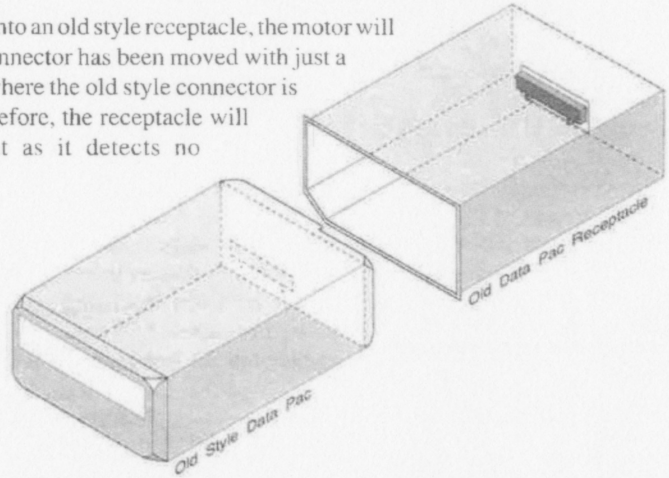
Whilst a DataPacII receptacle is empty, the RME assumes the SCSI ID of that receptacle using the *Mask Circuit* and replies to any requests for access from that location as a CD ROM without a disk would do. Upon insertion of a DataPacII, the Receptacle Controller will pull the drive into the receptacle and take control of the SCSI Bus before powering it up - this makes sure that no activity is taking place while the drive motor is started, thus, avoiding the possibility of data loss through electrical glitches. Once powered up and tested, the DataPacII is given the SCSI ID of the receptacle and operates as a standard high speed SCSI hard drive.

When ejection is requested, either by software command or in response to the eject button being pressed, the Receptacle Controller first checks if that receptacle has been locked via software or hardware; if it has, the eject request is disallowed. If the receptacle has not been locked, however, the Receptacle Controller informs the *LMS Circuit* that an eject is required. It is the job of the *Last Message Sent Circuit* to watch the SCSI bus very carefully for a point at which no activity is taking place. This is of great importance as SCSI commands can be convoluted at times and it is important not to eject a drive which is in the middle of performing a remote task (even though the SCSI bus is free). For this reason the LMS waits for the *command complete* message to be issued by the drive it is monitoring and then lets the Mask Circuit know that it is safe to mask out the SCSI ID, allowing the Receptacle Controller to emulate that drive. As with DataPacII insertion, the Receptacle Controller will gain control of the SCSI bus to prevent data being transferred, and switch off the drive motor. The bus is released for general use and after a short delay to allow the drive to stop spinning (the heads automatically park), the DataPacII is pushed out of the receptacle ready to be taken away.

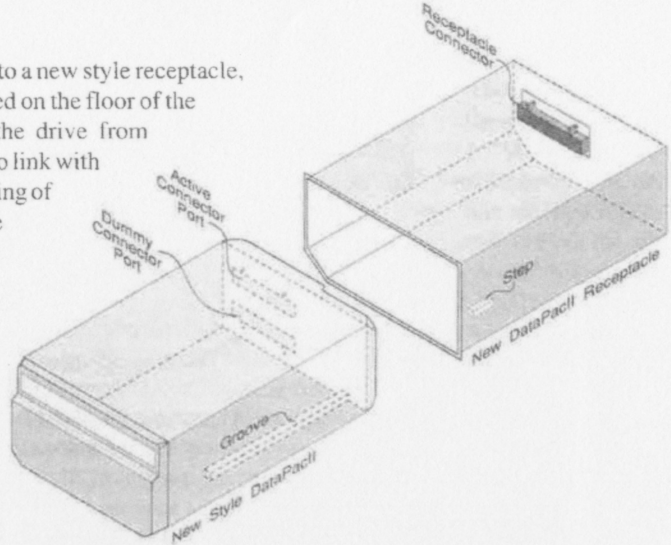
Old and New Receptacles

The old Data Pac and new DataPacII drives are directly incompatible with each other, even though it is possible to use both within the same system (discussed on pages 20 and 21). Thus, it is not possible to use a DataPacII in an old style receptacle and vice versa. To prevent electrical damage to drives resulting from insertion into the wrong type of receptacle, Tandon has made design alterations in the DataPacII and its corresponding receptacle.

If a DataPacII is inserted into an old style receptacle, the motor will pull it in, however, the connector has been moved with just a dummy hole remaining where the old style connector is usually positioned. Therefore, the receptacle will push the DataPacII out as it detects no connection.



If a Data Pac is inserted into a new style receptacle, the step which is positioned on the floor of the receptacle will prevent the drive from being pushed far enough to link with the loading arms. The casing of the DataPacII has a groove to correspond with the step that allows it to pass into the receptacle normally.

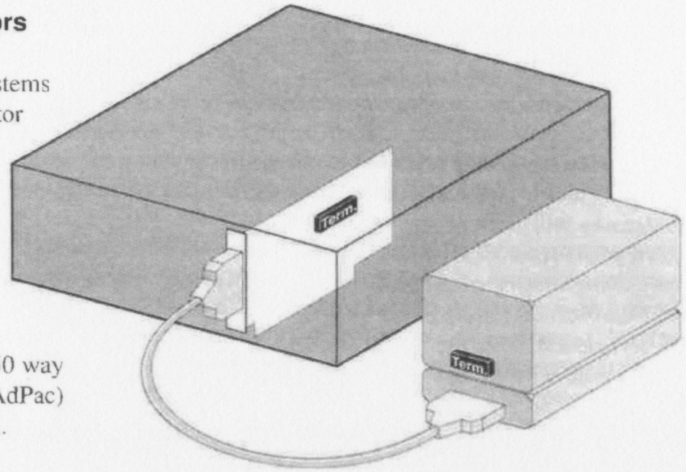


There are eight available *Identity* or *ID* numbers available on a SCSI bus; these are labelled 0 to 7, where 7 is the highest priority and is usually used by the host adapter. When fitting an AdPacII and/or AdPac/mx to a system, care must be taken when assigning SCSI IDs for each device. The AdPacII, especially, requires two SCSI ID's; one for the receptacle and one for its RME (see page 18), although more than one RME can share a single SCSI ID number. The SCSI IDs are set on both the AdPacII and AdPac/mx on their back panels, using DIP switches on the AdPacII (see pages 26 & 27) and a rotary selector on the AdPac/mx (see page 25). The AdPacs may be fitted to standard PC compatibles or to Apple Macintosh systems using the relevant Tandon ISA, EISA and MCA host adapters or Mac fitting kit. Similarly, either AdPac can be attached to the PacII, however, this uses four of the available eight IDs internally (4 and 5 for its receptacles, 3 for its RME and 7 for its on-board host adapter), leaving SCSI IDs 0 and 1 for AdPacIIs (AdPac/mx units can also use IDs 2 and 6).

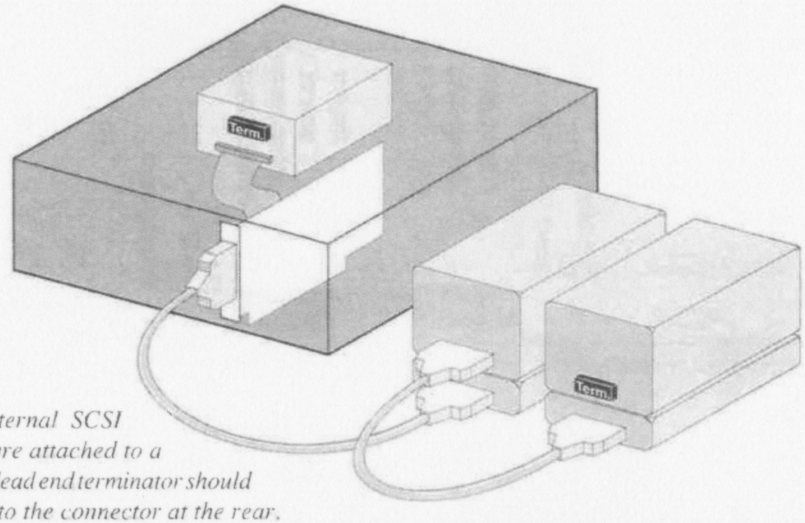
Proper termination of the SCSI bus is essential for correct operation of the AdPacs and other SCSI devices. Quite simply, the bus, which runs from one device to the next (in reality consisiting of more than one physical cable) *daisy-chaining* them together, must be terminated at its two extreme ends only. On most SCSI devices the terminator consists of one or more resistor packs which are either fitted or removed depending upon the location of that device along the cable. In the example below, the simplest SCSI link is shown between a host adapter and a single AdPac, where the adapter and the AdPac are both terminated.

Cables & Terminators

PacII and AdPacII systems use a *dead end* terminator (p/n 932022-001).
AdPac/mx models use an *in-line* terminator (p/n 193945-001).
An MCA/Macintosh to AdPac cable has the p/n 193941-001.
A standard 50 way to 50 way SCSI cable (PacII to AdPac) has the p/n 195769-001.



The second example shown opposite has a host adapter linked to an internal SCSI device as well as two AdPacs. The host adapter now has its terminator removed because it no longer lies at the end of the bus. In this situation, the internal SCSI device and the last AdPac have terminators. Care should also be taken that the total length of the collective cable does **not exceed 6 metres** as performance degradation and data errors may occur.



If no external SCSI devices are attached to a PacII, a dead end terminator should be fitted to the connector at the rear.

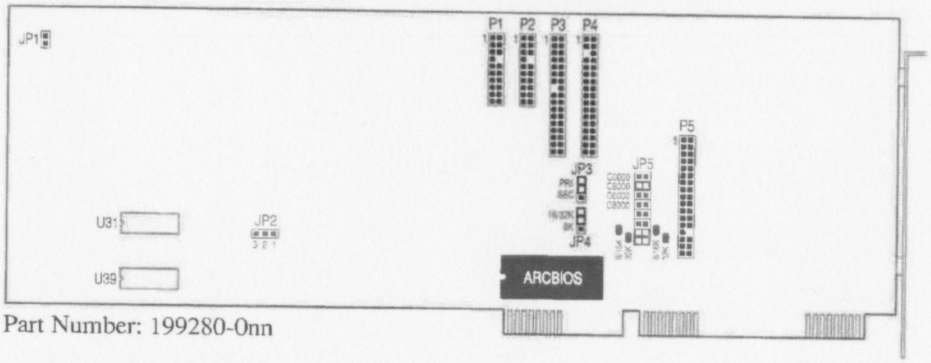
The old style Ad-PAC devices, controlled by the Tandon ARC Board, may be used in conjunction with the PacII system and/or the AdPacII to allow data transfer between the older Data Pacs and the new DataPacII drives. When an ARC board is used in conjunction with an AdPacII or PacII, it should be fitted with ARC BIOS version 1.6 or later (available from Tandon subsidiaries and distributors). Using the RLLSETUP utility, supplied with the old Data Pac drives, in advanced mode (by typing **`RLLSETUP/A`** at the DOS prompt) the BIOS Unit Number for the old Data Pac receptacle should be as low as possible, i.e. BIOS Unit 80H if no hard drive is fitted, with a second such receptacle at the next available BIOS Unit Number. When the system boots up, the DataPacII receptacle(s) in the system will be assigned using the BIOS Unit Numbers following those of the old style receptacles. A similar configuration is required when using the AdPacII within old style PAC 286 or PAC 386sx systems except that the BIOS Unit Numbers 80H and 81H are assigned within System Setup.

DOSPAC.SYS

When operating under MS DOS, a device driver is supplied as standard with the DataPacII models which provides support for their special features and also supports the old style Data Pac drives. This driver is called DOSPAC.SYS and can operate under MS DOS versions 3.3, 4.01 and 5.0. In cases where a mixture of old Data Pac and new DataPacII receptacles are used in conjunction, the old device driver DPACCESS.SYS must be replaced with the new driver DOSPAC.SYS. For more information about the DataPacII drivers and utilities, refer to the DataPacII Installation Guide.

ARC Board (Fixed Interrupt Model)

Used to control Ad-PACs, In-PACs and ST 506 (RLL) hard drives.



Part Number: 199280-0nn

JP3	
PRI	On-board floppy controller is Primary
SEC	On-board floppy controller is Secondary

JP2 should be set with **no jumper fitted** for optimum results.

C0000	C8000	D0000	D8000	JP5 ARC BIOS Address
ON	OFF	OFF	OFF	C000 to C7FF
OFF	ON	OFF	OFF	C800 to CFFF
OFF	OFF	ON	OFF	D000 to D7FF
OFF	OFF	OFF	ON	D800 to DFFF

Upgrade the ARC BIOS version to **1.6** or later when used inconjunction with AdPacIIs or PacIIs.

The jumpers shown at the bottom of **JP5** and **JP4** select the size of ARC BIOS used. Production boards have always used 32KB BIOS chips and these jumpers should not be altered. **JP3** and **P4** are not fitted on all models of ARC board.

P1 In-PAC/ST 506 drive data (2)
P2 In-PAC/ST 506 drive data (1)
P3 In-PAC/ST 506 drive control
P4 Floppy disk control
P5 Ad-PAC option board connector
JP1 Hard disk activity LED connector

Most models of ARC board have 64KB of cache RAM. This can be upgraded to 128KB by adding two Dynamic RAM (DRAM) chips of the **2464-12** (120 nano second access time) to sockets **U31** and **U39**.

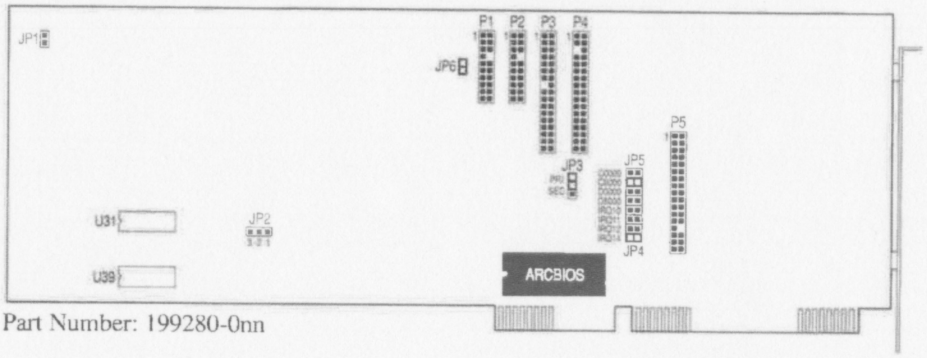
The error messages displayed by this ARC board are listed on page 53.

ARC Board models with fixed interrupt: -001, 003, 031, 037, 051, 053, 071, 073

ARC board models with selectable interrupts: -002, 004, 006, 032, 034, 036, 072, 074, 076

ARC Board (Selectable Interrupt Model)

Used to control Ad-PACs, In-PACs and ST 506 (RLL) hard drives.



Part Number: 199280-0nn

JP3	
PRI	On-board floppy controller is Primary
SEC	On-board floppy controller is Secondary

JP3, JP6 and **P4** are not fitted on all models of ARC board.

IRQ 10	IRQ 11	IRQ 12	IRQ 14	JP4 Interrupt Select
ON	OFF	OFF	OFF	IRQ 10
OFF	ON	OFF	OFF	IRQ 11
OFF	OFF	ON	OFF	IRQ 12
OFF	OFF	OFF	ON	IRQ 14

JP2 should be set with **no jumper fitted** for optimum results.

C0000	C8000	D0000	D8000	JP5 ARC BIOS Address
ON	OFF	OFF	OFF	C000 to C7FF
OFF	ON	OFF	OFF	C800 to CFFF
OFF	OFF	ON	OFF	D000 to D7FF
OFF	OFF	OFF	ON	D800 to DFFF

The error messages displayed by this ARC board are listed on **page 53.**

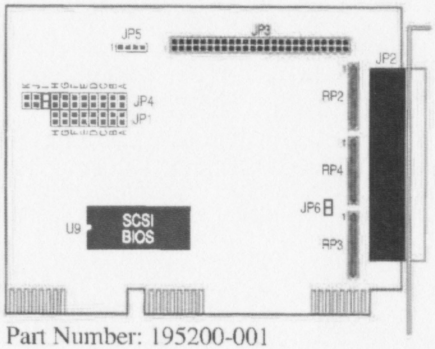
Upgrade the ARC BIOS version to **1.6** or later when used inconjunction with AdPacIIs or PacIIs.

JP6	
ON	Request zero wait state I/O transfers
OFF	Do not request zero wait states

P1 In-PAC/ST 506 drive data (2)
P2 In-PAC/ST 506 drive data (1)
P3 In-PAC/ST 506 drive control
P4 Floppy disk control
P5 Ad-PAC option board connector
JP1 Hard disk activity LED connector

Most models of ARC board have 64KB of cache RAM. This can be upgraded to 128KB by adding two Dynamic RAM (DRAM) chips of the **2464-12** (120 nano second access time) to sockets **U31** and **U39**.

The Tandon AT/SCSI Host Adapter, known as the *Sphinx*, is a highly compact ISA interface board based around the NCR53C400 SCSI controller chip. It has multiple address and IRQ selection with 8KB on-board RAM supporting up to 2MB/sec asynchronous data transfers.



Part Number: 195200-001

Position	JP1	JP4	Interrupt
A	ON	ON	IRQ5
B	ON	ON	IRQ10
C	ON	ON	IRQ11
D	ON	ON	IRQ12
E	ON	ON	IRQ14

Jumpers should be set in unison for each position on **JP1** and **JP4** when selecting the IRQ (positions **A** to **E**).

JP4-G	JP4-H	JP4-I	Address
ON	OFF	OFF	C800
ON	OFF	ON	CC00
ON	ON	OFF	D000
ON	ON	ON	D400
OFF	OFF	OFF	D800
OFF	OFF	ON	DC00

JP4 F	ON	Zero wait states on I/O bus
	OFF	Use wait states on I/O bus

JP4 K	ON	SCSI BIOS size 16KB
	OFF	SCSI BIOS size 8KB

JP6	ON	Terminator power supplied to SCSI bus
	OFF	Terminator power not supplied to bus

Terminator power must be supplied to the SCSI bus by at least one device. Best results are obtained if the two devices at the extreme ends of the cable supply term pwr.

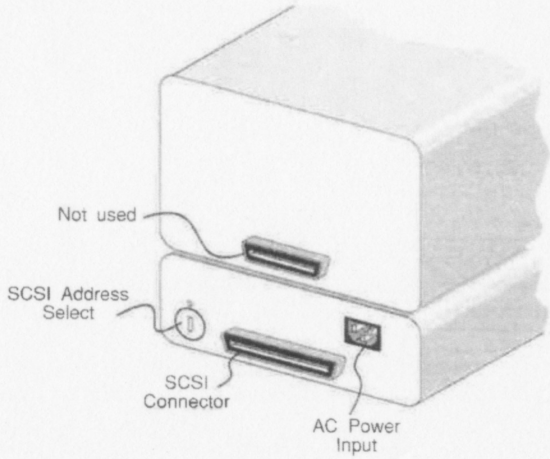
The SCSI terminators **RP2**, **RP3** and **RP4** must be removed if the SCSI Host Adapter is not positioned at the end of the SCSI cable.

JP1 positions **F**, **G** and **H** are reserved and should remain **OFF** (unjumpered). **JP4** position **J** is reserved and should remain **OFF**.

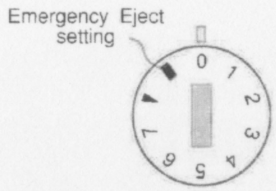
JP2 External SCSI conn.
JP3 Internal SCSI conn.
JP5 Activity LED conn.

The AdPac/mx allows the use of the old style Data Pac drives with a SCSI interface bus. Thus, Data Pac support can be easily added to Microchannel Architecture based systems and Apple Macintosh machines. The AdPac/mx can also be added to the Tandon PacII system to provide easy transfer of data from the old style Data Pacs to the new DataPacIIs.

The AdPac/mx has an old style receptacle mounted on top of a SCSI controller with an integral autosensing power supply. The unit has a 50 way female SCSI connector at the rear by which it is attatched to the host SCSI bus.



The SCSI ID of the AdPac/mx is set by turning the selector knob which is located on the back panel in the lower left hand corner. With the AdPac/mx switched off, the required SCSI ID is selected by turning the knob until the number required (from 0 to 7) is lined up with the notch at the top.

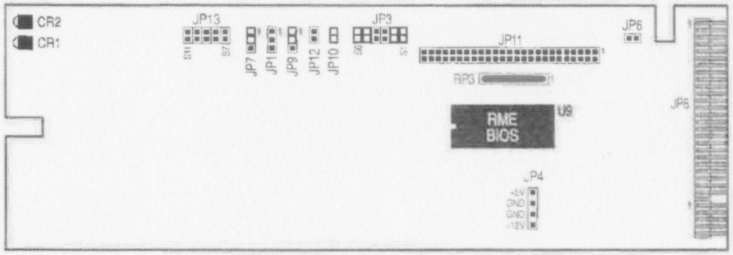


If it is required to remove a Data Pac from the receptacle that is not operating correctly, switch off the AdPac/mx and turn the knob until the small square shape lines up with the notch. Switch on the AdPac/mx and after a short time the Data Pac will be ejected.

Data Pacs ejected in this manner may not be parked correctly and must be handled with care.

The AdPac/mx will usually be connected at one end of a SCSI bus as it has no SCSI Out connector. The terminator with part number 193945-001 (model number TA 4000) will be used in these cases and plugs between the connector at the rear of the unit and the cable.

This controller board, known as the *Phoenix*, is used as the controller for the AdPacII and InPacII products. Sitting between the SCSI Host Adapter and a SCSI DataPacII, this board mediates between the two, controlling the insertion, ejection and communication routines. The small adapter board shown opposite is used when the Phoenix is used in an AdPacII.



Part Number: 194130-001

JP3 S6	ON	DataPacII set for normal ejection
	OFF	DataPacII receptacle locked

JP7	1-2	DataPacII set for normal ejection
	2-3	DataPacII set for emergency eject

JP9	1-2	RME BIOS size 16KB
	2-3	RME BIOS size 32KB

JP10	ON	Terminator power supplied to SCSI bus
	OFF	Terminator power not supplied to bus

JP12	ON	Enable on-board LEDs (InPacII setting)
	OFF	Disable on-board LEDs (AdPacII setting)

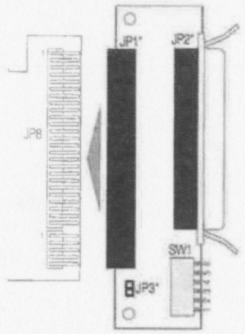
JP13 S7	ON	Enable emulation (overrides SW1-6)
	OFF	SW1-6 setting determines mode

JP1 RME test header
JP4 Internal power conn.
JP6 Cooling fan connector
JP8 External SCSI conn.
JP11 Receptacle SCSI conn.
CR1 Yellow *Activity* LED
CR2 Green *Ready* LED

Terminator **RP3** should be fitted when this board is used in the InPacII configuration and removed for AdPacII control.

Terminator power must be supplied to the SCSI bus by at least one device. Best results are obtained if the two devices at the extreme ends of the cable are used to supply terminator power.

JP13 positions S8, S9, S10 and S11 are reserved and should remain OFF (unjumpered).



AdPacII Adapter Board

Part Number 194892-001

When the Phoenix board is used within an AdPacII system, the small adapter board shown above is attatched to JP8 and this provides a male 50 way IEEE-488 type connector and DIP switches which are available at the rear of the AdPacII casing. In an **AdPacII configuration**, RP3 will be removed and JP3 (positions S1 to S5) will contain no jumpers, with SW1 on the adapter board being used for SCSI ID setting. When used in an **InPacII configuration**, the terminator RP3 will be fitted and the jumper JP3 used to select the SCSI ID options (also JP13 position S7 will be set ON).

AdPacII ▶ / InPacII ▶	SW1-5 / JP3-S5	SW1-4 / JP3-S4	SW1-3 / JP3-S3	RME ID
	ON	ON	ON	0
	ON	ON	OFF	1
	ON	OFF	ON	2
	ON	OFF	OFF	3
	OFF	ON	ON	4
	OFF	ON	OFF	5
	OFF	OFF	ON	6
	OFF	OFF	OFF	7

Ad ▶ / In ▶	SW1-2 / JP3-S2	SW1-1 / JP3-S1	DataPacII ID
	ON	ON	0
	ON	OFF	1
	OFF	ON	4
	OFF	OFF	5

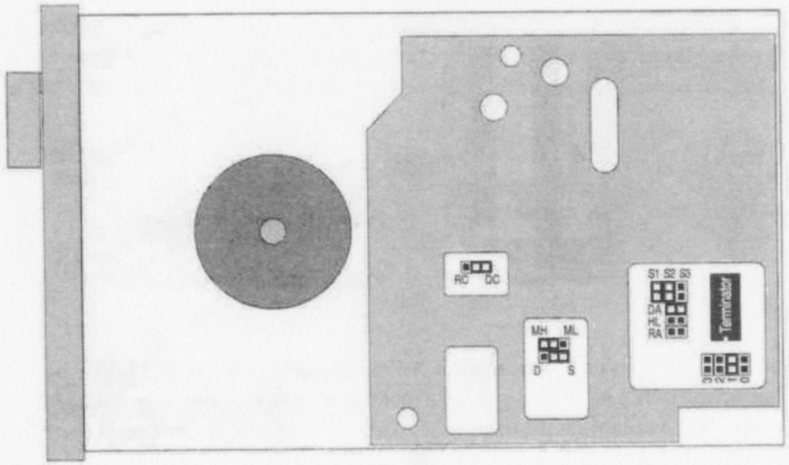
JP1* AdPacII adapter conn.
JP2* AdPacII SCSI conn.

Care must be taken when selecting SCSI ID's. The DataPacII and RME ID's must not clash with each other or any SCSI devices in the system. However, more than one RME may occupy the same ID. Refer to the warning given on page 7 when attaching to a PacII system.

SW1-6	ON	RME emulates an inserted DataPacII after reset (PC Mode)
	OFF	No RME emulation of inserted DataPacII after reset (Macintosh Mode)

JP3*	ON	SW1-6 setting enabled
	OFF	SW1-6 setting disabled

Epson 5.25" Floppy Drive



Model: Epson SD-680L

0	1	2	3	
ON	OFF	OFF	OFF	Selected by DS0 signal
OFF	ON	OFF	OFF	Selected by DS1 signal
OFF	OFF	ON	OFF	Selected by DS2 signal
OFF	OFF	OFF	ON	Selected by DS3 signal

DA	HL	RA	
ON	OFF	OFF	Head is loaded by DS signal
OFF	ON	OFF	Head is loaded by HL signal
OFF	OFF	ON	Head is loaded by MON signal
OFF	OFF	OFF	Head is loaded by HL and DS signals

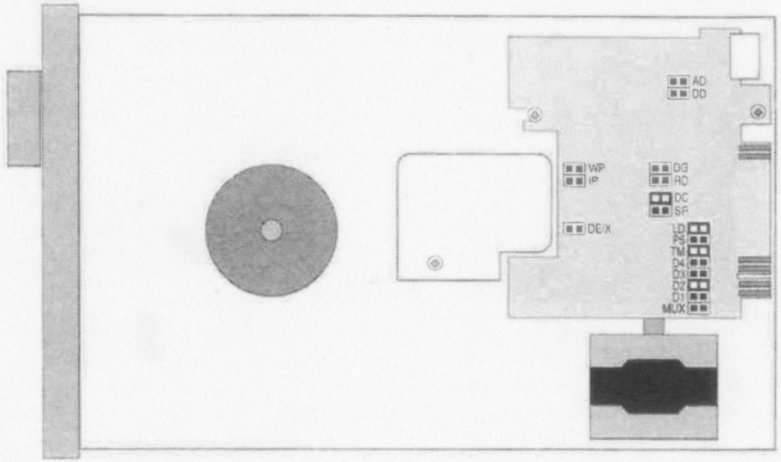
S1	S2	S3	
ON	ON	OFF	LED is lit by DS signal
OFF	ON	ON	LED is lit by IUL and DS signals
ON	OFF	ON	LED is lit by Ready State signal
OFF	ON	OFF	LED is lit by DS or IUL signals
OFF	OFF	OFF	LED is lit by IUL signal

RC	DC	
ON	OFF	Pin 34 isReady
OFF	ON	Pin 34 is Disk Change

ML	MH	
ON	OFF	MOD signal is H: NORM mode
		MOD signal is L: HIGH mode
OFF	ON	MOD signal is H: HIGH mode
		MOD signal is L: NORM mode

D	S	
ON	OFF	300 rpm (dual speed)
OFF	ON	360 rpm (single speed)

Toshiba 5.25" (6882) Floppy Drive



Model: Toshiba FDD6882

D1	D2	D3	D4	MUX	
ON	OFF	OFF	OFF	OFF	Selected by DS0 signal
OFF	ON	OFF	OFF	OFF	Selected by DS1 signal
OFF	OFF	ON	OFF	OFF	Selected by DS2 signal
OFF	OFF	OFF	ON	OFF	Selected by DS3 signal
OFF	OFF	OFF	OFF	ON	Drive always selected

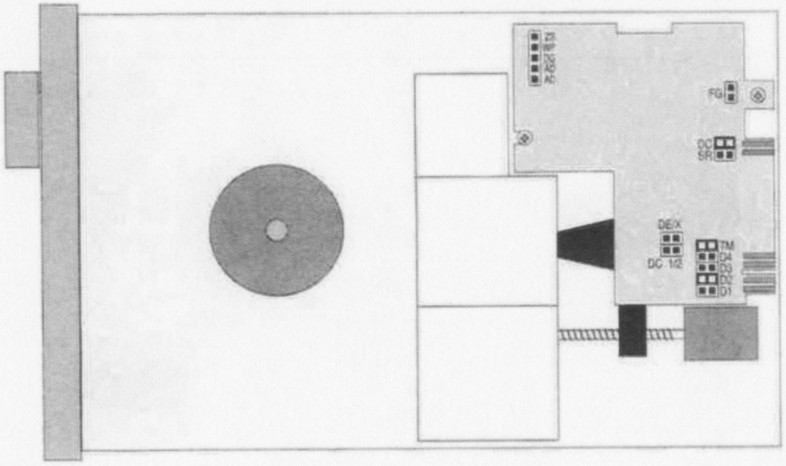
DE/X	
ON	Motor speed is selected by MODE signal
OFF	Motor speed is fixed at 360 rpm

LD	P5	
ON	OFF	LED is lit by DS signal
OFF	ON	LED is lit by DS and Ready signals

DC	SR	
ON	OFF	Output of pin 34 is Disk Change
OFF	ON	Output of pin 34 is Ready

TM	
ON	Input signals terminated
OFF	Input signals un-terminated

Toshiba 5.25" (6784) Floppy Drive



Model: Toshiba FDD6784

D1	D2	D3	D4	
ON	OFF	OFF	OFF	Selected by DS0 signal
OFF	ON	OFF	OFF	Selected by DS1 signal
OFF	OFF	ON	OFF	Selected by DS2 signal
OFF	OFF	OFF	ON	Selected by DS3 signal

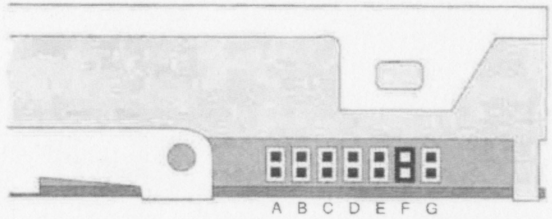
DE/X	
ON	Motor speed is selected by MODE signal
OFF	Motor speed is fixed at 360 rpm

DC	SR	
ON	OFF	Output of pin 34 is Disk Change
OFF	ON	Output of pin 34 is Ready

TM	
ON	Input signals terminated
OFF	Input signals un-terminated

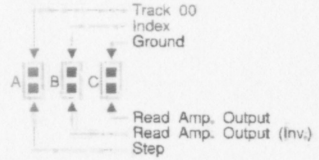
Canon 3.5" Floppy Drive

Model: Canon MD3611



Side View

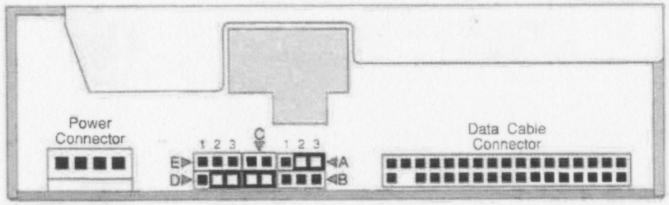
Jumpers **A**, **B** and **C** are manufacturing test points with the following layout:



Jumpers **D**, **E**, **F** and **G** determine which Drive Select is used to enable the drive and they are set as in the table below.

D	E	F	G	
OFF	OFF	OFF	ON	Selected by DS0 signal
OFF	OFF	ON	OFF	Selected by DS1 signal
OFF	ON	OFF	OFF	Selected by DS2 signal
ON	OFF	OFF	OFF	Selected by DS3 signal

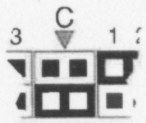
Model: Epson SMD-340-127



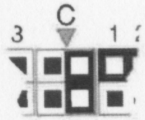
Rear View

A	**1-2**	Drive is selected by Drive Select 0
	2-3	Drive is selected by Drive Select 1

B	**1-2**	Drive is selected by Drive Select 2
	2-3	Drive is selected by Drive Select 3



The H/L density mode is switched by the internal sensor.

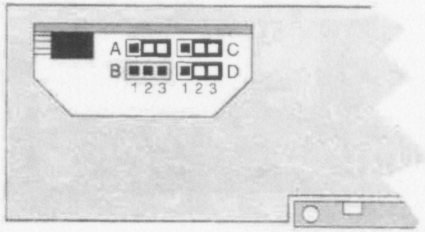


The H/L density mode is switched by the HDI input.

D	**1-2**	Changes to high density mode with the HDI input LOW
	2-3	Changes to high density mode with the HDI input HIGH

The pins at position **E** are manufacturing test points.

Model: Epson SMD-440



Side View

A	**1-2**	Drive is selected by Drive Select 0
	2-3	Drive is selected by Drive Select 1

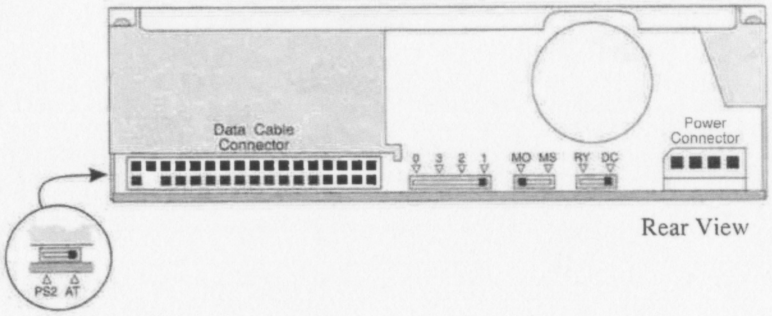
B	**1-2**	Drive is selected by Drive Select 2
	2-3	Drive is selected by Drive Select 3

C	**1-2**	The H/L density mode change is caused by the internal sensor
	2-3	The H/L density mode change is dependant on the HDI input

D	**1-2**	Changes to high density mode with the HDI input LOW
	2-3	Changes to high density mode with the HDI input HIGH

Panasonic 3.5" Floppy Drive

Model: Panasonic JU257L373PD



Rear View

0	1	2	3	
ON	OFF	OFF	OFF	Selected by DS0 signal
OFF	ON	OFF	OFF	Selected by DS1 signal
OFF	OFF	ON	OFF	Selected by DS2 signal
OFF	OFF	OFF	ON	Selected by DS3 signal

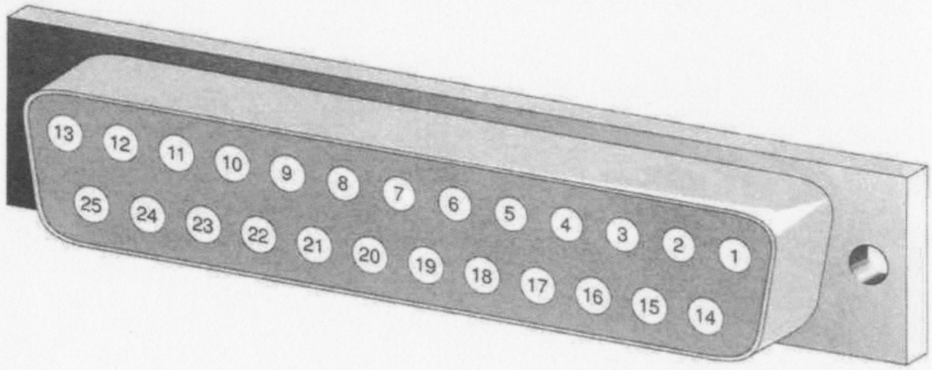
MO	MS	
ON	OFF	Enables drive motor with Motor On
OFF	ON	Enables drive motor with Drive Select

PS2	AT	
ON	OFF	Mode signal is: Low-2MB & High-1MB
OFF	ON	Mode signal is: Low-1MB & High-2MB

RY	DC	
ON	OFF	Output of pin 34 is Ready
OFF	ON	Output of pin 34 is Disk Change

Parallel Port Pin-out

A parallel printer port is provided as standard on the PacII system. The port has a 25 pin female D-type connector to which a standard IBM parallel printer cable may be attached. The pin-out of the parallel port is given below.



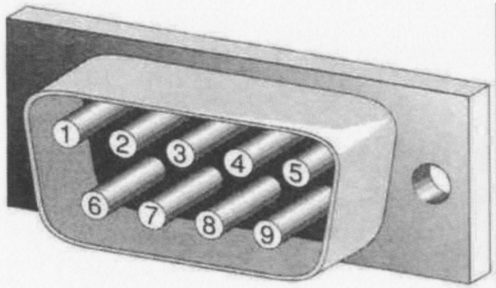
Pin Number	Function
1	/Strobe
2	Data 0
3	Data 1
4	Data 2
5	Data 3
6	Data 4
7	Data 5
8	Data 6
9	Data 7
10	/Acknowledge
11	Busy
12	Paper End
13	Select

Pin Number	Function
14	/Auto Feed
15	/Error
16	/Initialise
17	/Select In
18	Ground
19	Ground
20	Ground
21	Ground
22	Ground
23	Ground
24	Ground
25	Ground

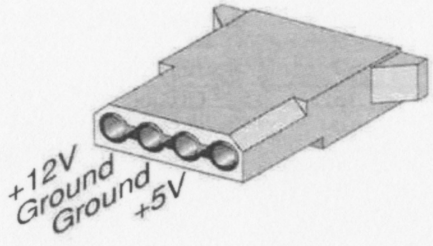
Signal names prefixed with "/" are active low.

36 Serial Port & Drive Power Lead Pin-outs

The PacII system has two serial ports fitted as standard which conform to the RS 232C standard and are made available at the rear of the system via 9 pin male D-type connectors. The pin-out of the connectors is shown below.



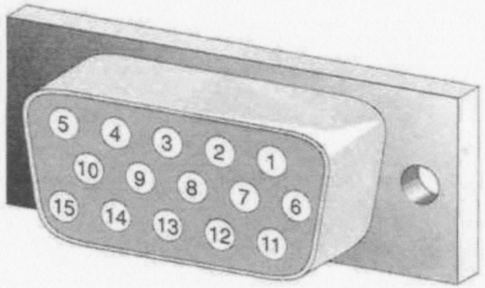
Pin Number	Function
1	Data Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator



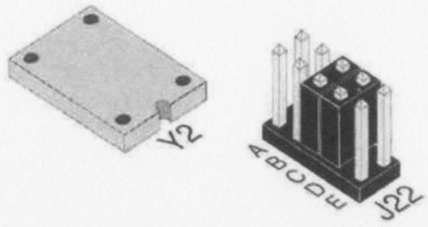
The PacII system has a 130W power supply unit which has one of the drive power connectors shown left.

VGA Video Port Pin-out & Configuration 37

The PacII has a Super VGA video controller built onto the motherboard with 512KB of video RAM as standard. The port is made available at the rear panel of the system via a 15 pin female D-type connector. The pin-out of the connector is given below.



Pin Number	Function
1	Red
2	Green
3	Blue
4	ID bit 2
5	Ground
6	Ground
7	Ground
8	Ground
9	Reserved
10	Ground
11	ID bit 0
12	ID bit 1
13	Horiz Sync
14	Vert Sync
15	Reserved

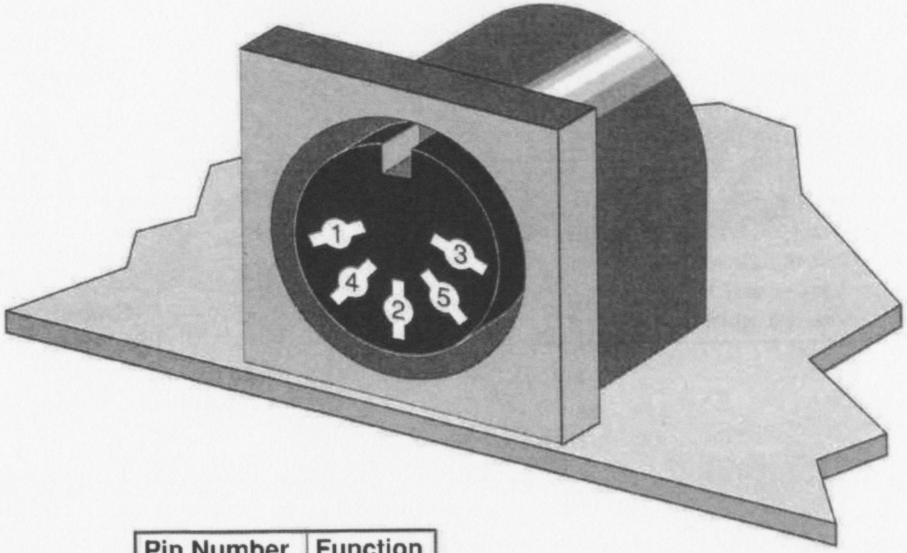


With BIOS 3.78 and above, a choice of several 800 x 600 resolution modes are given and these are determined by the settings of **J22** and the crystal installed at position **Y2** (normally empty). **J22** positions **C** and **D** should remain **ON** and position **E** should be **OFF**.

If an adapter video BIOS is found at **C000H** during boot-up, the on-board video controller will be disabled automatically.

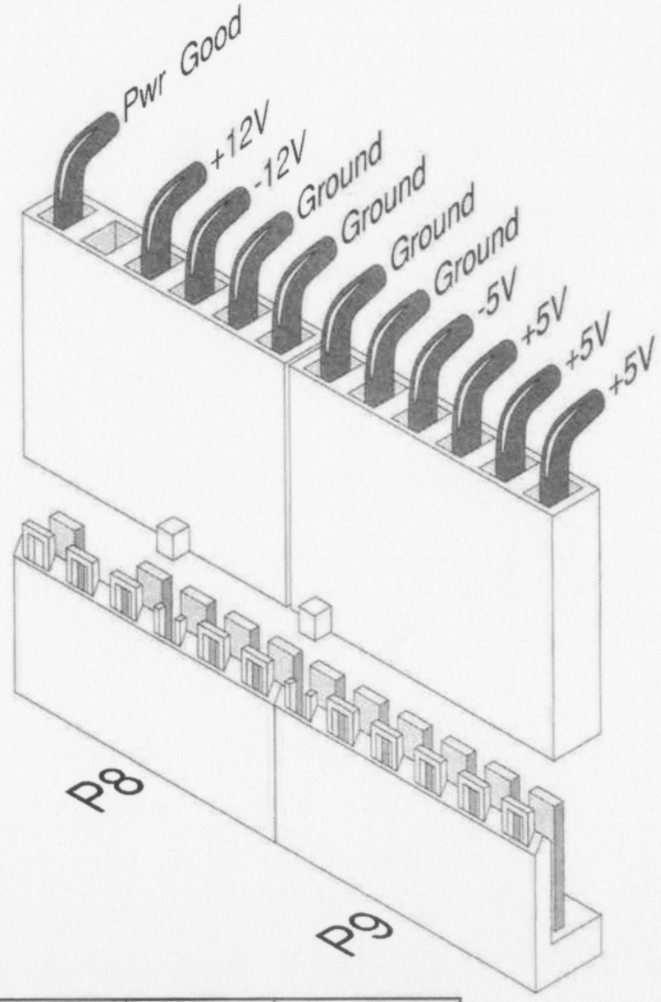
J22-A	J22-B	Y2	Simultaneous Colours	Vert. Sync	Resolution
OFF	OFF	Empty	256	56Hz	800 x 600
ON	OFF	40MHz	256	60Hz	800 x 600
OFF	ON	50MHz	256	72Hz	800 x 600

The keyboard connector used on the PacII system is a standard 5 pin DIN socket situated at the rear of the motherboard and is accessible from the back panel of the system. The signals available at the connector are shown below.



Pin Number	Function
1	Reserved
2	Data
3	Clock
4	+5VDC
5	Ground

Four voltage levels are supplied to the motherboard from the 130W power supply via the dual connector arrangement shown in the diagram below.



Voltage	Max. Load	Tolerance	Output Ripple
+5V	16A	+5%/-4%	100mV p-p
+12V	3A	+5%/-4%	150mV p-p
-5V	0.5A	+5%/-4%	100mV p-p
-12V	0.5A	+5%/-4%	150mV p-p

BIOS Versions & Revisions

The Tandon System BIOS, produced by the Tandon Software Engineering Division, is derived from a single source code that is compiled into versions for each of the different systems ranging from basic 80286 models up to high power 80486 based units. Each product type has a version number for which revisions are assembled as updates occur in the source code. The version numbers for existing Tandon systems are shown below.

System	Version	Chip(s)
PCA/8 or 10	V209	2 x 27256
PCA/12	V211	2 x 27256
SL (Type A)	V201	2 x 27256
SL (Types B & C)	V211	2 x 27256
PAC 386sx	V302	2 x 27256
PacII	V215	1 x 29C010
MCS (Option)	V217	1 x 27C010
MCS pro	V303	1 x 27C512

System	Version	Chip(s)
286/N & 386/N (A)	V205	2 x 27512
286/N & 386/N (B)	V206	1 x 27C010
386/16, 20 & 25(B)	V301	4 x 27256
386/25(A) or 33	V305	2 x 27256
486/25 or 33	V402	1 x 27512
LT/286	V220	2 x 27C512
LT/386sx	V320	2 x 27C512
NB386sx	V325	1 x 27C1024

The initial release of the PacII BIOS (V215) was revision 3.77. Revision 3.78 introduced the selection of certain extended graphics modes using J22 as shown on page 37. The PacII system board can use either a standard EPROM BIOS chip (27C010) or a Flash EPROM chip (29C010) and J48 must be set accordingly (see page 7). Flash EPROMs are re-programmable whilst in place on the motherboard and allow the BIOS revision to be upgraded by simply inserting a specially prepared floppy diskette available from Tandon subsidiaries and distributors.

For diagnostic purposes the BIOS of the PacII will send codes to the I/O address 0080H while it is booting up. By using an interface board which decodes this address and displays the data on an LED display (these interfaces are referred to as *Milestone Boards*), the system may be more easily and accurately diagnosed if a problem has occurred, especially if no screen display is given or beep codes sounded. The codes used by this system also apply to the following BIOS's: V217 (MCS/Option), V303 (MCS pro) and V402 (486 Desktop and Tower). A full list of these Power On Self Test codes is given on pages 46 to 49.

Error Codes (BIOS 3.xx)

Beep Codes

Tone: **long, short, long, short, and system halts.**
Problem: Counter/Timer failure.
Action: Replace motherboard.

Tone: **short, long, short, and system halts.**
Problem: RAM Refresh failure.
Action: Replace motherboard.

Tone: **long, long, long, and system halts.**
Problem: System RAM failure.
Action: Check SIMMs. Make sure they are seated correctly.

Tone: **short, short, short, and system halts.**
Problem: BIOS ROM Failure.
Action: Checksum error in BIOS ROM segment. Replace BIOS ROMs.

Tone: **long, long, and system halts.**
Problem: No video adapter is installed.
Action: Install a monochrome or color video adapter, or select "Optional" for "Initial Video Display" in the System Setup Screen (for network server applications).

Tone: **long, long, long, long and system halts.**
Problem: Video adapter board has failed.
Action: Replace video adapter board.

Tone: **long, long, long, long, long and system halts.**
Problem: Failure of processor or 76C10 chip-set self-tests
Action: Use Milestone Board to pin-point the exact failure (refer to page 46). Replace processor board or motherboard as necessary if problem persists.

Error Messages (Critical)

Message: ***[00:00] No BASIC Support - Halting***
Codes: Primary 00 Secondary 00
Problem: The application in use has invoked a non-existent ROM BASIC.
Action: Reboot the system. This program does not run properly, as there is no BASIC ROM installed.

Message: ***[14:xx] Main Board Component Failure - Halting***
Codes: Primary 14 Secondary 00 - DMA controller 0
10 - DMA controller 1
Problem: The direct memory access controller has failed one or more tests.
Action: Restart system. If the problem persists, replace the motherboard.

Message: *[16:22] Main Board Component Failure - Halting*
[16:xx] Failure - Halting
Codes: Primary 16 Secondary 00 - Interrupt controller 0
10 - Interrupt controller 1
20 - Unexpected interrupt
22 - Timer 0 failed (CTC only)
Problem: A failure was detected in the timer controller (22) or interrupt controller (xx) circuits.
Action: Restart system. If the problem persists, replace motherboard.

Message: *[17:00] RAM Parity Failure - Halting*
Codes: Primary 17 Secondary 00
Problem: The system detected a hardware parity error in RAM.
Action: Restart system. If the problem persists, replace motherboard.

Message: *[20:xx] Keyboard Failure - Halting*
Codes: Primary 20 Secondary 00 - Response failure
10 - Response failure
20 - Response failure
11 to 1F - Self-test failure
Problem: The keyboard has failed one or more tests.
Action: Check the keyboard cable for proper connection, and/or replace the keyboard.

Message: *[23:xx] Keyboard Failure - Halting*
Codes: Primary 23 Secondary xx - Improper self-test response
Problem: The keyboard has been identified as an XT type keyboard (XT keyboards are not supported).
Action: Replace the keyboard with an AT type keyboard.

Message: *[24:xx] Keyboard Failure - Halting*
Codes: Primary 24 Secondary xx - Communications error
(xx represents the keyboard controller's response.)
Problem: A communication error between the keyboard and the system unit has occurred.
Action: Check that the keyboard is properly connected.

Message: *[62:00] RAM Parity Failure - Halting*
Codes: Primary 62 Secondary 00
Problem: The system has detected a memory parity error in the I/O memory.
Action: Restart system. If the problem persists, replace the I/O memory module.

Message: *[7E:01] Hard Disk Ctlr Failure - Halting*
Codes: Primary 7E Secondary 01
Problem: Error communicating with the Tandon RLL controller.
Action: Replace the Tandon RLL controller.

Error Messages (Recoverable)

Message: *[01:00] System is Locked*
Press "Enter" to continue -
Codes: Primary 01 Secondary 00 - Keyboard Locked
Problem: The system is locked.
Action: Unlock and press <Enter>.

Message: *[01:xx] Tandon Controller Not Supported due to IRQ14 Conflict*
Codes: Primary 01 Secondary 00 - No interrupt detected
06 - Two controllers using IRQ14
55 - Hardware failure
Problem: An IRQ (interrupt) selection problem has been detected on one or both disk controllers.
Action: Check the controller IRQ jumper settings and/or replace the defective controller.

Message: *[12:xx] CMOS Failure*
Codes: Primary 12 Secondary 17 to 3F (Address of memory failure.)
Problem: CMOS memory has failed one or more tests.
Action: Replace motherboard.

Message: *[21:xx] Keyboard Failure*
Codes: Primary 21 Secondary 01 - Clock line stuck low
02 - Clock line stuck high
03 - Data line stuck low
04 - Data line stuck high
Problem: The keyboard controller has failed one or more tests.
Action: Check that the keyboard is properly connected. Replace if necessary.

Message: *[22:xx] Keyboard Failure*
Codes: Primary 22 Secondary xx - Indeterminate keyboard type
(xx represents a two digit code number.)
Problem: The keyboard has failed one or more tests.
Action: Check that the keyboard is properly connected. Replace if necessary.

Message: *[23:xx] Keyboard Failure*
Codes: Primary 25 Secondary xx - Improper self-test response.
Problem: The keyboard failed to reset properly.
Action: Check that the keyboard is properly connected. Replace if necessary.

Message: *[26:xx] Keyboard Failure*
Codes: Primary 26 Secondary xx - Key scan code
Problem: A keyboard key is stuck down, or has failed one or more tests.
Action: Inspect the keyboard and free any keys found stuck down. If no problem is observed, replace the keyboard.

Message: *[30:xx] Diskette Drive Failure*
Codes: Primary 30 Secondary 00 - Diskette drive 0
01 - Diskette drive 1
Problem: A diskette drive or the controller has failed one or more tests.
Action: Check diskette drive power and data cables for condition and proper connection. Reconnect any loose cables, or replace any damaged cables. If problem persists, replace either floppy drive or controller.

Message: *[50:xx] Mono Adapter Failure*
Codes: Primary 50 Secondary 00 - Video page 0
01 - Video page 1
Problem: The Monochrome video adapter has failed one or more tests.
Action: Inspect the monochrome video adapter, and reinstall it in the expansion slot. If the problem persists, replace the monochrome video adapter.

Message: *[51:xx] Video Adapter Failure*
Codes: Primary 51 Secondary 00 - Video page 0
01 - Video page 1
02 - Video page 2
03 - Video page 3
Problem: The colour video adapter has failed one or more tests.
Action: Inspect the colour video adapter, and reinstall it in the expansion slot. If the problem persists, replace the colour video adapter.

Message: *[60:xx] Expansion Adapter Installation Failure*
Codes: Primary 60 Secondary 00 - EGA adapter
10 to 3F - other adapters
40 - adapter at E000
Problem: An adapter board BIOS overlay ROM has failed the checksum test.
Action: Remove or replace the bad adapter. Check that two adapter ROM's are not overlapping each other within the memory map.

Message: *[70:00] No Boot Device Available*
Codes: Primary 70 Secondary 00
Problem: There is no bootable device in the system.
Action: Place a bootable diskette in the diskette drive. If you normally boot from a fixed disk, check the power and data cables to the fixed disk for condition and proper connection.

Message: *[70:xx] No Active Partition Found*
Codes: Primary 70 Secondary 80 - Disk Unit 80
81 - Disk Unit 81
82 - Disk Unit 82
83 - Disk Unit 83
Problem: The boot record was successfully read from the fixed disk, but none of the partitions are active.
Action: Activate one of the partitions on the disk unit indicated using FXPREP.

Message: *[71:xx] Disk Unit Load Failure*
Codes: Primary 71 Secondary 80 - Disk Unit 80
81 - Disk Unit 81
82 - Disk Unit 82
83 - Disk Unit 83
Problem: Fixed disk xx or its controller failed one or more tests.
Action: Check all fixed disk drive power and data cables for condition and proper connection. Reconnect any loose cables, or replace any damaged cables. If the problem remains, replace the fixed disk or controller.

Message: *[72:xx] Disk Unit Load Failure*
Codes: Primary 72 Secondary 80 - Disk Unit 80
81 - Disk Unit 81
82 - Disk Unit 82
83 - Disk Unit 83
Problem: The boot record could not be read from the disk device at unit xx.
Action: Check all fixed disk power and data cables for condition and proper connection. Reconnect any loose cables, or replace any damaged cables. The fixed disk or Data PAC may require reformatting. If the problem remains, replace the drive concerned.

Message: *[73:xx] Disk Unit Load Failure*
Codes: Primary 73 Secondary 80 - Disk Unit 80
81 - Disk Unit 81
82 - Disk Unit 82
83 - Disk Unit 83
Problem: The boot record was read succesfully, but a valid signature was not found.
Action: Reformat the device at disk unit xx.

Message: *[75:01] Diskette Load Failure*
Codes: Primary 75 Secondary 01
Problem: The system was unable to read the diskette while attempting to boot.
Action: Load a bootable diskette. Check all diskette drive cables for condition and proper connection. Reconnect loose cables or replace any damaged cables.

Message: *[75:03] No System Diskette Found*
Codes: Primary 75 Secondary 03
Problem: Diskette boot record is bad.
Action: Load a different bootable diskette. Check all diskette drive power and data cables for condition and proper connection. Reconnect any loose cables, or replace any damaged cables.

Power On Self Test Codes

The following pages show the meaning of diagnostic codes which are sent by the PacII system to port 80H whilst the machine is performing its POST routines. By using an interface board (Milestone Board) which decodes the address 080H and displays the data written at this address, a faulty system can be more easily diagnosed.

Error Code	Description of Error Code/Check Point
01	Check point indicating cold boot.
06	Check point indicating the start of any initialisations necessary for the gate array (if any).
07	Check point indicating a warm boot. It also indicates that a keyboard selftest is about to commence.
08	Check point during cold boot indicating a successful pass of some of the keyboard initialisation stages.
09	Check point after keyboard selftest but before the BIOS checksum test.
0A	Check point after BIOS checksum test but before battery test.
0B	Check point before saving the battery condition in CMOS diagnostic/status register.
0C	Check point after saving the battery condition in CMOS diagnostic/status register. This would indicate that the above write was successful.
0D	Check point before 8254 Timer/Counter test. At this point RAM parity, I/O parity, both DMA controllers and the speaker are disabled while Timer/Counter 2 is enabled.
0E	Error code displayed if any of the timer/counters of the 8254 fail the test. It is followed by another AAH code which, itself is followed by one more data byte containing the number of the counter or timer that failed the test.
0F	Check point displayed before the set refresh and refresh tests. First, this test initialises the timers: Timer 0 is set up in mode 3 for 55 mS square wave. Timer 1 is set up in mode 2 as a rate generator for the RAM refresh. Finally this test verifies RAM refresh.
10	Error code displayed if the memory refresh fails.

Power On Self Test Codes (cont.)

Error Code	Description of Error Code/Check Point
11	Check point displayed before the system RAM test. The RAM test checks the first 64KB of RAM and then initialises it to zero. Failure of the RAM test is indicated by three long beeps and then the system hangs.
12	Error code shown when the above system RAM test failed.
13	Check point indicating the above system RAM test passed.
14	Check point indicating that the zero-fill of the 1st 64KB of system RAM is about to commence.
15	Check point displayed after the read/write test of the CMOS RAM.
16	Check point displayed before reset of the Dragon SCSI (53C400) bus, and after setting the processor speed to what is indicated in the CMOS RAM. If the CMOS RAM test failed, the processor speed is set to LOW.
17	Check point before resetting the receptacle controller in cold boot only.
18	Check point shown before testing the interrupts and setting up the interrupt vectors. This test will verify and initialise the two 8259 interrupt controllers.
1A	Check point shown after testing the interrupt controllers.
1B	Check point shown before installation of the phantom interrupt handler INT 0F (Spurious interrupts produce INT 0F with no "in service" indicator).
1C	Check point after installation of the phantom interrupt handler INT 0F. If this point is reached then a spurious interrupt didn't occur. This check point also indicates the beginning of the Timer 0, system IRQ 0 and software INT 8 tests.
1D	Error code indicating that the Timer 0 test failed. Timer 0 interrupt never occurred. System is halted.
1E	Check point indicating the successful test of the two 8259 interrupt controllers. For Dragon systems this code is followed by a 1FH code.
20	Check point shown before setting up vectors for interrupts 02H to 1FH.
21	Check point shown before setting up vectors for interrupts 70H to 77H.

Error Code	Description of Error Code/Check Point
22	Check point shown before resetting vectors for the hard drive.
23	Check point shown before the keyboard selftest.
24	Check point shown after reading the DMA channel 2 page register to see if the keyboard selftest command was successful.
25	Error code indicating that the keyboard selftest command failed.
26	Check point indicating that the keyboard selftest was successful.
27	Check point shown confirming DMA working, and before preparing DMA channel 2 (floppy) for transfer.
28	Check point shown before re-initialising the video.
29	Check point shown during re-initialisation of video with cursor off.
2A	Check point shown after re-initialising the video parameters.
2B	Check point shown before enabling NMI and I/O channel checks, and before disabling Timer 2 and the system speaker.
2C	Check point shown before system RAM memory sizing.
2D	Check point shown if RAM sizing was skipped because of shadowing.
2E	Check point shown before sending a reset command to the keyboard which initiates a keyboard scan cycle.
2F	Check point shown after initialising the keyboard and before initialising the CMOS Real-Time Clock (RTC).
30	Check point shown after initialising the CMOS RTC.
31	Check point shown after installing the on-board floppy (if any).
32	Check point shown after disk controller installation.
33	Check point shown before equipment check.
34	Check point shown after initialisation of the numeric data processor.

Error Code	Description of Error Code/Check Point
35	Check point shown after serial/parallel ports installation.
36	Error code displayed if the battery is bad or there was a power loss.
37	Check point shown before enabling system Tick timer, keyboard and the slave interrupt controller.
38	Check point shown after enabling system Tick timer, keyboard and the slave interrupt controller.
39	Check point shown before enabling the keyboard interface/interrupts. This test will go to Setup as necessary.
3A	Check point after going into Setup as necessary and before a Clear Screen command is issued.
3B	Check point shown after the PLEASE WAIT ... message and before testing the fixed/floppy drives.
3C	Check point shown after testing the fixed/floppy drives.
3D	Check point shown after installing adapter ROMs.
3E	Check point shown after turning off gate A20.
3F	Check point shown as the last indicator before the system boots-up.
BF	Error code displayed if Gadget or Manticore processor boards are used in a system where the WD76C10 chipset is not revision F or above.
CF	Error code displayed if the i486 CPU on a Gadget processor board has failed its internal self test.
DF	Error code displayed if a Manticore processor board fails to correctly initialise its on-board cache (bad cache RAM, illegal configuration, etc.)
EF	Error code displayed if the extended CMOS RAM within the WD76C10 chipset fails its self test.

There are two LED indicators on the old style Data Pac receptacles, one orange and one green. The orange LED serves the same purpose as that of a normal hard drive in showing when activity is taking place. The green LED, however, is used to indicate the status of that particular Data Pac channel. It does this by displaying various flash patterns and these are summarised below with the problems that they signify.

Steady or symmetrical ON/OFF.

The green LED is either ON continuously or blinks with equal ON and OFF periods. These are normal operational patterns.

ON	If no Data Pac is installed then the receptacle is ready to receive a Data Pac. If the Data Pac is inserted and fully seated in the receptacle then the Data Pac is loaded and ready to use.
ON 1/4 sec **OFF 1/4 sec**	Indicates that a Data Pac is being loaded or unloaded. Wait until the green LED stops blinking to access the Data Pac.
ON 1 sec **OFF 1 sec**	Indicates that the heads have been parked on the installed Data Pac for transport.

Blinking OFF from normally ON state.

The number of ready LED OFF blinks in each 2 second cycle is the ERROR NUMBER. This indicates abnormal condition of the receptacle or Data Pac. As a precaution, the Data Pac should be handled with care when ejected since the controller cannot determine if the heads are safely parked.

1 OFF pulse	5 second timeout during Data Pac loading. Indicates possible failure or jam of the loading mechanism in the receptacle.
2 OFF pulses	5 second timeout during Data Pac unloading. Indicates possible failure or jam of the loading mechanism that pushes the Data Pac from the receptacle.
3 OFF pulses	Data Pac not installed after load. The Data Pac has been pulled into the receptacle and initially seated, but has become unseated from the connector.
4 OFF pulses	Head load 20 second timeout. Indicates a hardware failure of the Data Pac or the controller, or an intermittent failure of the Data Pac.

Blinking ON from Normally OFF State

The number of green LED ON blinks in each 2 second cycle is the error number. These blinks indicate an abnormal condition. The Data Pac should be handled with care when ejected since the Data Pac is in a "Head Unsafe" condition.

1 ON pulse	ABORT during ready. If the spindle motor appears much noisier than normal, shock damage to the bearings may have occured. THE Data Pac SHOULD BE COPIED IMMEDIATELY TO PREVENT LOSS OF DATA SHOULD THE BEARINGS SEIZE AT A LATER TIME.
2 ON pulses	ABORT during spindle motor/head load startup. The Data Pac is installed and an attempt has been made to start the drive spindle motor, load the heads, and complete the calibration of the head servo. The blink indicates a failure of one of these three steps or a failure of the controller board. Since most of these failures leave the heads loaded, THE Data Pac SHOULD BE HANDLED VERY CAREFULLY WHEN EJECTED TO PREVENT DAMAGE DUE TO LOADED HEADS.
3 ON pulses	Data Pac no longer installed during startup. This blink indicates that the Data Pac has become unplugged from the receptacle connector. THE Data Pac SHOULD BE HANDLED WITH CARE AFTER EJECTION and reinserted and ejected normally as soon as possible to prevent head/media damage.
4 ON pulses	5 second timeout during head unload. This blink indicates an error occurred during head parking. Data Pac SHOULD BE HANDLED WITH CARE WHEN EJECTED TO PREVENT FURTHER DAMAGE.
5 ON pulses	Data Pac IN during ejected state. This blink indicates that the controller has detected an installed Data Pac when it thinks the Data Pac is ejected. Handle with care if ejected manually or from an error state.

Fast Blink of Both Receptacles's LEDs

The green LED's blink in unison at 1/8 sec ON, 1/8 sec OFF (4 times per second). This indicates a receptacle controller hardware failure.

DataPacII Receptacle Flash Codes

There are two LED indicators on a DataPacII receptacle, one orange and one green. The orange LED serves the same purpose as that of a normal hard drive in showing when activity is taking place. The green LED, however, is used to indicate the status of that particular DataPacII channel. It does this by displaying various flash patterns and these are summarised below with the problems that they signify.

The error codes are shown as a number of 1/8 second ON pulses (separated by 1/8 second OFF pulses) within a two second cycle. Error code 2, for example, will be shown as two ON pulses every two seconds. Error code 8 would be shown as a continuous sequence of alternating ON and OFF pulses.

Error Code	Error Description
1	DataPacII loading timed out
2	DataPacII unloading timed out
3	DataPacII detected when ejected
4	DataPacII not detected when inserted
5	Not used
6	RME memory test failed
7	Not used
8	Not used

With the exception of error code 6, all the error codes are displayed on the green LED of the receptacle where the failure was detected. Since error code 6 is independant of the receptacles, it will be displayed on the green LED of first receptacle, and the indicator of the second receptacle will be turned off.

ARC Board Error Messages

[nnn] Controller Hardware Failure
Installation Failure

These messages indicate an unrecoverable hardware failure on the ARC board and it will probably need to be replaced. The three figure number **[nnn]** corresponds to the following failures:

[200] Diagnose Error
[210] Reset Error
[220] Data Path Controller Error
[230] RAM Failure
[240] 8049 Error
[250] Buffer Controller Error
[260] IRQ Test Failed

[nnn] Disk System Configuration Error
Please run RLLSETUP utility
Installation Failure

These messages indicate a problem with the ARC EEPROM information. Re-running RLLSETUP will usually correct the problem. The three figure number **[nnn]** indicates the nature of the problem.

[300] Incorrect EEPROM ID bytes
[310] Incorrect EEPROM checksum
[320] Information in system CMOS and that in EEPROM does not match (e.g. CMOS indicates a system fixed disk and EEPROM shows no system fixed disks).

[nnn] RLL Device Failure

The first two digits of this error code specify the problem. The last digit of the error code gives the RLL Device Number.

[40n] RLL fixed disk **n** fails to assert ST506 ready. Possible sources of this are cabling errors or defective cabling/fixed disk.

[41n] RLL fixed disk device **n** is not readable. There are many possible causes, among them: disk is unformatted, wrong drive type, bad cabling, defective drive.

[42n] RLL Receptacle device **n** does not respond. This problem can be caused by a faulty receptacle unit or incorrect/loose cabling.